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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/045,354	11/07/2001	Angela Hui	AF01159	1692

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EXAMINER

NGUYEN, KHIEM D

ART UNIT PAPER NUMBER

2823

DATE MAILED: 12/20/2002

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

10/045,354

Applicant(s)

HUI ET AL.

Examiner

Khiem D Nguyen

Art Unit

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☐ Responsive to communication(s) filed on ____.
- 2a) ☐ This action is FINAL. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-23 is/are pending in the application.
- 4a) Of the above claim(s) ____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) ____ is/are allowed.
- 6) ☒ Claim(s) 1-23 is/are rejected.
- 7) ☐ Claim(s) ____ is/are objected to.
- 8) ☐ Claim(s) ____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 07 November 2001 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.
- Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- 11) ☐ The proposed drawing correction filed on ____ is: a) ☐ approved b) ☐ disapproved by the Examiner.
- If approved, corrected drawings are required in reply to this Office action.
- 12) ☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. §§ 119 and 120

- 13) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. ____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- * See the attached detailed Office action for a list of the certified copies not received.
- 14) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).
- a) ☐ The translation of the foreign language provisional application has been received.
- 15) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☒ Information Disclosure Statement(s) (PTO-1449) Paper No(s) 2.
- 4) ☐ Interview Summary (PTO-413) Paper No(s) ____.
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other:

DETAILED ACTION

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

1. Claims 1-20 are rejected under 35 U.S.C. 103(a) as being unpatentable over Hemmenway et al. (U.S. Patent 5,270,265) in view of Bothra (U.S. Patent 6,159,844).

Hemmenway teaches a method of stripping a hard mask 11 from a substrate 42 comprising an insulated material 21 exposed within gaps patterned 43 through the hard mask wherein the insulating material comprises silicon oxide and the hard mask material comprises silicon nitride and wherein the hard mask is employed to etch a layer of the substrate comprising silicon, a silicon wafer and a polysilicon layer, comprising (See col. 3, line 15 to col. 4, line 26 and FIGS. 4-8):

coating the substrate with a sacrificial material 51 comprises resists that fills the gaps; and

plasma etching to strip the sacrificial material and the hard mask (See col. 4, lines 14-17) wherein plasma etching completely removes the sacrificial material from the gaps (See FIG. 8).

Hemmenway fails to teach wherein the plasma etching is carried out with gases comprising a fluorinated hydrocarbon and oxygen as recited in present claims 7.

Bothra discloses in (col. 7, lines 29-39 and TABLE B) wherein the plasma etching to strip the photoresist mask and the silicon nitride layer is carried out with gases comprising a fluorinated hydrocarbon and oxygen (CHF_3/O_2). Brothra also discloses in (col. 6, lines 23-24) wherein the sacrificial material is spin-coated onto the substrate. It would have been obvious to one of ordinary skill in the art of making semiconductor devices to incorporate Bothra's teaching into Hemmenway's method in order to avoid photoresist trapping (See col. 4, lines 47-48).

2. Claims 21-23 are rejected under 35 U.S.C. 103(a) as being unpatentable over Hemmenway et al. (U.S. Patent 5,270,265) in view of Bothra (U.S. Patent 6,159,844).

Hemmenway teaches a method of removing a hard mask 11 comprising (See col. 3, line 15 to col. 4, line 26 and FIGS. 4-8):

forming an oxide region 21 over a semiconductor substrate 42 (See FIG. 4);

forming a silicon layer 15 over the semiconductor substrate, wherein the silicon layer covers the oxide region (See FIG. 4);

forming and patterning a hard mask layer 11 over the silicon layer (See FIG. 4);

etching a gap 43 in the silicon layer to exposes a portion of the oxide region using the patterned hard mask as an etch mask (See FIG. 4);

forming a sacrificial layer comprises a photoresist layer 51 over the semiconductor substrate, thereby covering the hard mask layer and filling gap (See FIG. 4);

removing the sacrificial layer and the hard mask layer with a dry etch (See col. 4, lines 14-17 and FIGS. 7-8);

Hemmenway fails to explicitly teach the etch rate of the sacrificial and the hard mask layer as recited in present claim 21.

However, it would have been obvious to one of ordinary skill in the art of making semiconductor devices to determine the workable or optimal ranges for the etch rate of the sacrificial and the hard mask layer through routine experimentation and optimization to obtain optimal or desired device performance because the etch rate of the sacrificial and the hard mask layer is result-effective variables and there is no evidence indicating that the etch rate of the sacrificial and the hard mask layer is critical and it has been held that it is not inventive to discover the optimum or workable range of a result-effective variable within given prior art conditions by routine experimentation. See MPEP 2144.05.

Hemmenway fails to teach spinning coating the sacrificial layer over the semiconductor substrate as recited in present claim 23. Brothra discloses in (col. 6, lines 23-24) wherein the sacrificial material is spin-coated onto the substrate. It would have been obvious to one of ordinary skill in the art of making semiconductor devices to incorporate Brothra's teaching into Hemmenway's method in order to avoid photoresist trapping (See col. 4, lines 47-48).

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Khiem D Nguyen whose telephone number is (703) 306-0210. The examiner can normally be reached on Monday-Friday (8:00 AM - 5:00 PM).

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If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Chaudhuri Olik can be reached on (703) 306-2794. The fax phone numbers for the organization where this application or proceeding is assigned are (703) 746-9179 for regular communications and (703) 746-9179 for After Final communications.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is (703) 308-0956.

K.N.

December 13, 2002



Olik Chaudhuri
Supervisory Patent Examiner
Technology Center 2800